MEMORANDUM **CH2MHILL**

# Approach Outline - Mitigation/Treatment Evaluation

TO: Mary Kay Voytilla/USEPA

COPIES: Ben Cope/USEPA
Bill Hudson/CH2M HILL
John Riley/Pyrite Hydrochem
Nick Zilka/IDEQ
Dale Ralston
Bob Hopper/Bunker Hill
Jay Dehner/CH2M HILL
Ken Green/CH2M HILL
Bob York/CH2M HILL
Mike Thomas/IDEQ
Mike Fitzgerald/Terragraphics
Kirk Nordstrom/USGS
Dick Glanzman/CH2M HILL



FROM: Matt Germon/CH2M HILL
Jim Stefanoff/CH2M HILL

DATE: November 23, 1999

The purpose of this memorandum is to present an outline of the approach to be used for the mitigation/treatment evaluation for the Bunker Hill Mine Water Management Project. The evaluation consists of a number of steps outlined in the project flowchart that was recently distributed. These steps are attached as Figure 1. The purpose of the mitigation/treatment evaluation is to identify mitigations, CTP sizes, and storage sizes to carry forward into the development of remedial alternatives and subsequent detailed analysis for the feasibility study.

## Objectives

The specific objectives of the mitigation/treatment evaluation are as follows:

- Determine which AMD mitigations could provide cost savings if implemented as part of the long-term remedy for the Bunker Hill Mine Water Management project.
- Identify CTP/storage size combinations that will meet draft TMDLs, and assess the potential for changes in these sizes due to AMD mitigation implementation.
- Recommend mitigation measures, CTP sizes, and storage sizes to carry forward into remedial alternative assembly and detailed analysis.

## Approach Outline

The proposed approach for conducting the evaluation are as outlined in the following steps (refer to Figure 1):

1. **Conceptual Design/Cost Estimates (Figure 1, Box 1)** - Conceptual designs and cost estimates will be developed for the following AMD mitigations identified by the mine

water group (conceptual designs for West and South Milo diversions are already complete):

- Phil Sheridan raise diversion system in conjunction with West Milo diversion
- Phil Sheridan raise diversion system without West Milo diversion
- Surface diversions above Guy Cave
- Cemented backfill of Homestake/Utz
- Plug Small Hopes drift
- Mitigate Bunker Hill Dam
- Improve existing diversion (improve seal, decrease weir overflow)
- Improve existing diversion (increase pipeline capacity)
- Plug/bypass Inez Shaft
- Plug drill holes/pipe drill hole water

Additional field reconnaissance may be required to develop the conceptual design of these mitigations. Order-of-magnitude cost estimates for the above mitigations (+50%, -30%) will be developed based on the conceptual designs. Cost estimates for West and South Milo will be reviewed. Estimates will include capital, O&M, and NPV of capital and O&M (30 years at 5 percent interest).

2. **TMDL Compliance Evaluation (Figure 1, Box 2)** – The TMDL compliance evaluation tool being developed in the Draft Hydrologic Evaluation will be used to evaluate CTP and storage size combinations for compliance with the Draft TMDLs. This differs from the loading analysis conducted previously. Instead of determining how well different CTP scenarios meet TMDLs, CTP/storage scenarios will be forced to meet the TMDLs, and the resulting storage requirements will be determined. This approach was previously presented in the draft *Evaluation of Possible TMDL Compliance Strategies* memorandum dated September 20, 1999. The following initial assumptions will be used in the analysis:

   - Five water years will be evaluated to provide a range of high, medium, and low Kellogg Tunnel flow years. The water years will be the same as those included in the Draft Hydrologic Evaluation.
   - A range of effluent concentrations will be used for cadmium, lead, and zinc. The proposed range for each metal is presented below. The range will be clarified based on the results of the Phase I treatability testing.

     $0.1 \text{ ug/L} < \text{Cd} < 1.5 \text{ ug/L}$
     $0.1 \text{ ug/L} < \text{Pb} < 1.5 \text{ ug/L}$
     $5 \text{ ug/L} < \text{Zn} < 50 \text{ ug/L}$

   - A range of CTP sizes will be used in the analysis. A preliminary CTP sizing exercise will be conducted to determine the minimum CTP size that could theoretically be used at the site. The range will include the minimum CTP size, 2,500 gpm, 3,000 gpm, 3,500 gpm, 4,000 gpm, 5,000 gpm, and 6,000 gpm.
   - Treated water storage capacities to be evaluated will be 7.5 MG, 15 MG, and 25 MG.
   - CTP discharge will not exceed 100%, 105%, or 110% of the allowable load on a monthly basis.
   - Untreated (in-mine) storage will not be limited.
   - Irrigation will not be considered.

3. **Evaluate Changes in CTP/Storage Sizes (Figure 1, Box 3)** – The effectiveness in water reductions estimated for each mitigation will be applied to KT hydrographs for the five water years included in the above described TMDL compliance evaluation. Observations during piezometer installation will be used to update the current conceptual model for mine recharge. Effectiveness estimates for inflow reduction will be revised, if necessary, based on any changes to the conceptual model. TMDL compliance will then be re-evaluated to determine what changes in CTP/storage sizes could be obtained by implementation of the mitigations. Conceptual designs and cost estimates also will be developed for the storage scenarios included in the TMDL compliance evaluation.

4. **Assemble Components Without Mitigations (Figure 1, Box 4)** - Remedial components (AMD collection, conveyance, storage, treatment, and sludge management, but without mitigations) will be assembled into alternatives, and cost estimates for each component will be summed to establish baseline alternative costs without mitigation implementation.

5. **Cost/Benefit Analysis (Figure 1, Box 5)** – Cost estimates including mitigations will be developed for comparison to the alternatives that do not include mitigations.

6. **Summary Report** – A report will be prepared that summarizes the above steps and provides recommendations for feasibility study alternative development.

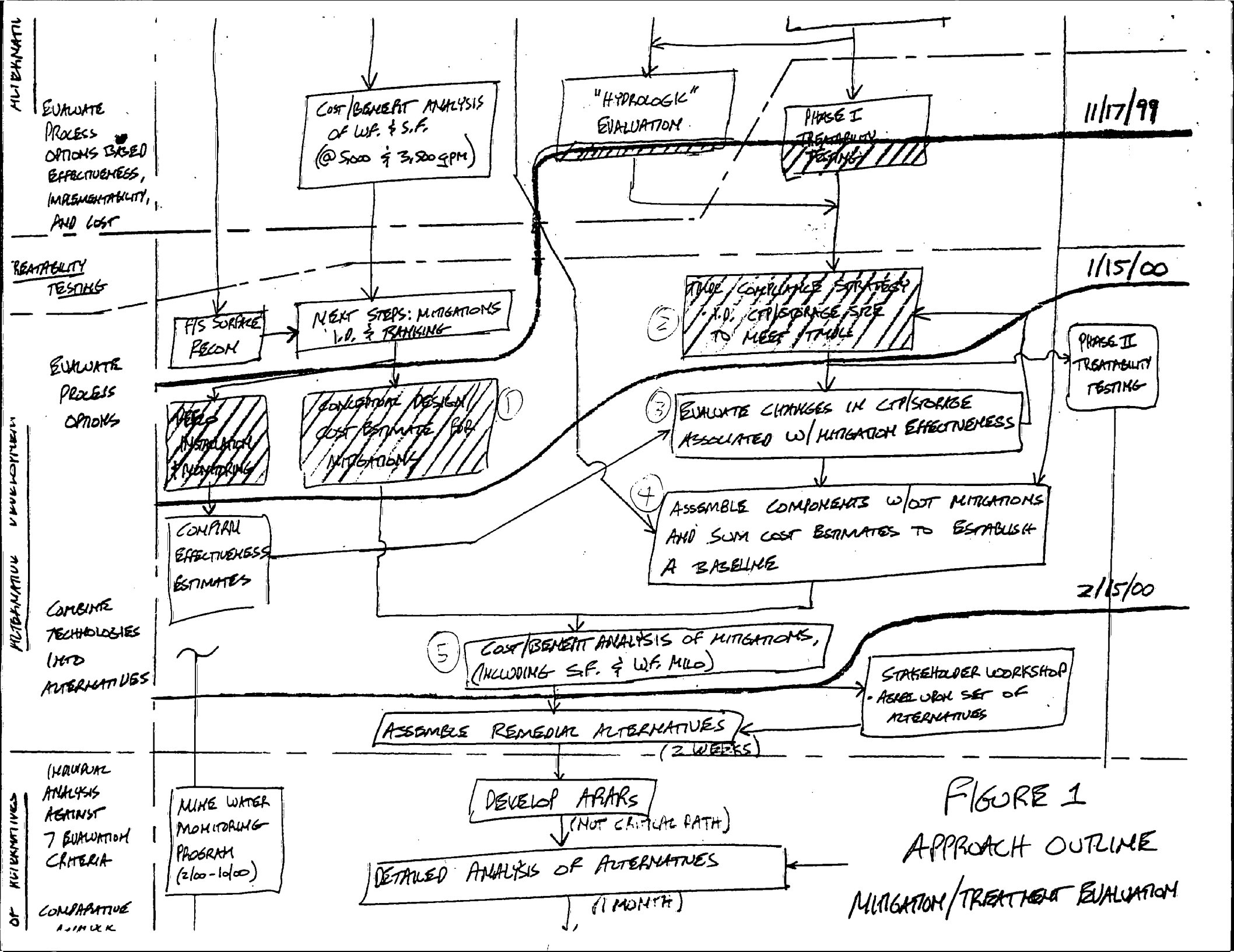


FIGURE 1

APPROACH OUTLINE

MITIGATION/TREATMENT EVALUATION